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Summary

The main purpose of this paper is to provide a framework for existing- and newly proposed inter-modal freight terminals in their business planning process. This framework is important for constructing- and improving the central terminal service portfolio of handling (loading, discharging, and transhipping) and storage of containerised cargo. Supportive activities (e.g. administration, customs) are taken into account as well. In particular, its aim is to investigate whether business planning offers a good approach for terminal operators in order to construct and improve their terminal service portfolio. The specific problem addressed here is as follows: *To what extent is Business Planning useful for terminal operators in order to be able to construct and improve their intermodal freight terminal service portfolio?* Questions that will be answered in this paper are: who is the principle agent in the combined transport channel? How can the terminal operator improve its market power in the combined transport chain? Should the terminal operator seek a take-over with a European logistics service provider? Should the terminal operator look for a merger with a physical transport company? Should the terminal operator look for acquisitions of other freight terminals? The terminal operator should look for a take-over by a global player? The conclusion of this paper is that business planning offers an excellent opportunity to terminal operators to better construct and operate their terminal service portfolio. The main conclusions are that:

1. Business planning provides a very useful framework to structure the planning process for the terminal operator. The three case studies suggest that the planning process by terminal operators can be improved;
2. Business planning is an ongoing process;
3. The terminal operators should aim for growth via a well-defined growth strategy (intensive-, integrative-, or diversification growth);
4. The terminal operator should have a clear strategy of overall cost leadership, differentiation, or focus.

Table of contents

1. Introduction

In Europe, the increasing interest in combined freight transport has heightened the need for research in this field. The inter-modal freight terminal that tranships the containers between truck, rail, ship and/or barge claims a central position in the combined transport chain. This central position especially holds true for the physical movement of containers (freight **flow).** Much of the current research on freight transport is based on a comparison between different transport modes and their related capabilities and (dis)advantages (Bithas and Nijkamp, 1996). However, this approach presents a problem in the sense that it fails to take into account the synergetic spectrum offered by combined transport solutions provided by logistics service providers, transport carriers (rail, road, and barge), and terminal operators. Scale enlargement via mergers and acquisitions of different transport modes may create true intermodal transport companies. A structured view on existing relations in transport and logistics markets is provided by Porter's model of the competitive forces (Porter, 1980). This model also provides insight into expected developments that face the actors in a market.

Transport of freight and the associated logistics will get more professional in the 2 1st century. Outsourcing of logistics will speed up and mergers and acquisitions will transform the transport and transhipment markets into a European-wide competitive arena with a number of large players and a number of specialists. The place of transhipment points (freight terminals) in the combined transport channel will change and improve. The main growth is expected in logistics management, order handling, value added activities, and IT. Intermodal freight terminals will be the central points in the future combined transport companies concerning the physical freight flows. Other flows out of the combined transport channel (e.g. information, value added activities, order handling, etc.) may be concentrated at the intermodal freight terminals as well. The marketing channel theory offers good insight into all the flows in the combined transport channel (Stem et al., 1988).

Time will increase further in importance. Currently, orders have to be fulfilled the same day (6%) and within 24 hours (20%). In 2003 these numbers are estimated to rise to 10% and 26% respectively (van Leeuwen, 2000). This results in further pressure on the offered combined transport solutions to increase their speed and reliability. A better coordination of arriving and departing trains and barges, together with a reduction of congestion at the intermodal terminals of trucks offers great potential for a reduction of total lead time of the combined transport solution. Furthermore, terminal internal processes can be executed at higher speed, leading to a further reduction of total lead time and bringing into reach more seamless inter-modal transport solutions.

The operations and goals of the inland terminal operators in Europe need to be analysed more thoroughly so as to provide insight in the full potential that is offered by the combined transport services they form part of. The aim of the present paper is to give insight into the business and strategic planning process in general, and the results of business planning applied to three case studies in Duisburg. For this purpose we use a theoretical framework (consisting of 14 steps) to structure the strategic- and business planning. This brings us to the central question of this paper: *To what extent is business planning useful for terminal operators in order to be able to construct and improve their intermodal freight terminal service portfolio?* Section 2 describes the theory of strategic planning, which forms the basis of our analytical framework (14 steps). Section 3 then deals with the three intermodal terminals and related transport networks in Duisburg. The final section contains the conclusion of this paper.

2. Strategic Planning

2.1 Introduction

Strategic planning and its collection of concepts and tools did not surface until the early 1970s. A number of shocks (e.g. oil crisis, inflation) called for a new management planning process that would keep firms healthy despite upsets in their businesses or product/service lines. At the end of the 1990s we observe a number of developments that will have great influence on the freight transport market in Europe in the coming years. Among others, company's have to cope with: Internet, rising fuel prices, increasing importance of the environment, scale enlargement of transport companies, rising importance of combined transport, and a low return on investment. The new planning concepts of the 1970s will be helpful to be competitive in the freight transport market in the 2010s.
The new planning process can be characterised by three key-ideas (Kotler, 1997):

1. Which businesses should be built, maintained, phased down, or terminated? Each business has another profit potential and the company resources should be allocated to the most profitable ones.
2. The future profit potential of each business has to be assessed. Future conditions in each market have to be analysed through sophisticated analytical scenarios. Current sales or profits are insufficient as a guide to which business a certain company should support.
3. The third key element of strategic planning is that of strategy. Each business of a company needs a plan to realise its long-run goals. There is not one particular strategy that fits all competitors in a certain industry. The strategy is influenced by the industry position, the objectives, opportunities, and resources.

For example, the following planning strategies can be found: cost reduction, innovation, diversification, and exploiting niches.

Nowadays, most companies consist of four organisational levels: corporate level, divisional level, business level, and product level. A corporate strategic plan is designed for guiding the whole company towards profits. In this plan decisions are made on resource allocation as well as which businesses to start or terminate. A division plan covers the resource allocation to each business unit within the division. Finally, each product or service within a business unit produces a marketing plan. The total process of strategic planning is shown in figure 1.

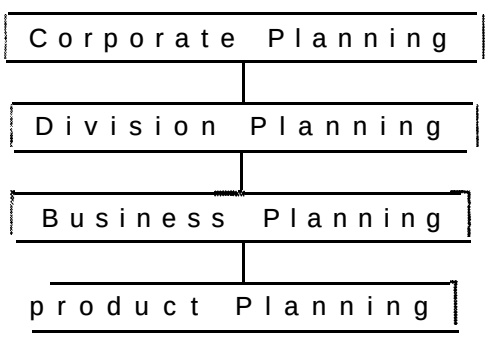

Figure 1: Elements of the strategic planning process
Source: Kotler, 1997

According to the size of the company and the company structure, one or more levels of the planning process should be carried out. Each company should identify the businesses they are in, and manage each as a business. Not each operating division is necessarily a business and vice versa. Two operating divisions may in fact form a single business, and one division may as well consist of several businesses. In general, a business can be defined according to

product definition or according to market definition. Therefore, a business can be viewed as a goods-producing process or as a customer-satisfying process. As customer needs last longer than the products that satisfy those needs, it is better to define a company's business according to market domain. A market-based business definition should not be to narrow. A freight terminal may perceive itself as a transhipment company, it may also see itself as a (combined freight) transport company and expand into offering combined transport services. The broadest possible concept for a terminal operator is that of a logistics service provider.

The planning process is followed by implementation and controlling. Corporate planning is characterised by broad mission statements, policies and strategies. Some companies set goals for their business units and get heavily involved in the planning process, others give a lot of freedom to their business units; they require only a certain performance level. Generally, corporate planning consists of the following four sub-phases:

1. Define company mission;
2. Identify strategic business units;
3. Analyse and evaluate current business portfolio;
4. Identify new businesses to enter.

The corporate mission is a statement defined in a broader environment. Over time, the mission may (need to) change to adapt to new circumstances. The search for the company's purpose contains questions like (de Vries et al., 1994): Who is our *customer? What is our business? What will our business be? What should our business be? What means value to our customers?* Furthermore, there are certain elements that influence the current mission. These elements are: the company's history, its current preferences, the market environment, its resources, and its distinctive competitive advantages. The company's history is important as a starting point for its future. The management and owners of a company do have preferences that shape a corporate mission. The market environment influences the mission. Its resources determine the possibilities of an organisation. Writing a mission statement is not easy, it may take up to two years to find a satisfactory statement.

Internal and external developments ▪ that are important for a certain company ▪ are investigated. In the transport market we observe a trend towards more deregulation, more competition, and more sustainability. Furthermore, we may expect an enormous consolidation wave in the freight transport market in Europe in the coming years. Reviewing and understanding existing developments and co-ordinating actions accordingly are very important (Stem et al., 1996). Currently, company internal developments are mainly reactive on external developments in the freight transport market. Besides reacting on external developments, companies that are active in the freight transport market may choose to act pro-actively.

2.2 Business planning and the intermodal freight terminal

A business plan is an arrangement for doing business at or using an intermodal freight terminal (e.g. buying terminal facilities and selling terminal services), considered in advance. The business plan will outline the strategy for the coming years for the terminal operator. Aspects like acquisition, personnel, finance, and terminal services will be included in the planning process. This section concentrates on the different steps that have to be taken in the business planning process. Subjects that are incorporated in the business plan are: i) Internal and external developments; ii) Entrepreneurial talent; iii) Customers; iv) History of the company; v) Successes and failures; vi) Employees; vii) Culture; viii) Services and activities; ix) SWOT analysis; x) Organisation; xi) Management; xii) Control; xiii) Information; ivx) Finance. These items are reviewed both in general and for the three terminals in Duisburg. Strategic (business) planning is the managerial process of developing and maintaining a viable fit between the organisation's objectives and resources and its changing market

opportunities. The aim of planning is to shape and reshape the company's businesses and products so that they combine to produce satisfactory profits and growth (Kotler, 1997).

Business planning is conducted within the broader framework provided by the company headquarters. The corporate planning is 'translated' into business unit planning. An important task of business planning is the external environment analysis to find the opportunities and threats that face the business unit. Monitoring the external environment consists of two tasks: I) following macroeconomic developments (e.g. technological, demographic, economic, etc.); and II) monitoring microeconomic actors. A business unit marketing opportunity could be defined as: *"an attractive area for company (or business unit) marketing action in which the company (or business unit) may enjoy a competitive advantage over its rivals"*. The value of a certain opportunity depends on its attractiveness and on its success probability. An external environmental threat is: *"a challenge posed by an unfavourable development that may lead to the erosion of a certain company (or business unit) position"*. Threats can be divided according to their seriousness and to the probability of occurrence.

The internal environment scan is characterised by analysing strengths and weaknesses for both company and business unit. Each business is evaluated in fields like marketing, finance, manufacturing, and organisational capabilities. Each element in this evaluation process has to be rated as major weakness, minor weakness, neutral, minor strength, or major strength. Furthermore, the importance of each element should be rated high, medium, or low. From this internal and external scans follow the goals of the business unit. Each business has numerous goals like market share improvement, profitability increase, reputation improvement, sales growth, etc. For these goals to work, they should meet the criteria of consistency, quantitative numbers, realistic, and hierarchical. Business goals should be consistent with each other and with the company goals; numerous goals are in a sort of trade-off relation to each other. Goals should be specified according to magnitude and time span. Realistic goals should come out of a clear defined planning process and not out of the blue. The business unit should determine which goal is the most important and so on in order to determine the hierarchy of the goals.

Goals have to be translated into a strategy for the business unit in order to realise the goals stated. According to Porter, three types of strategies can be distinguished: I) overall cost leadership (try to realise the lowest costs); II) differentiation (try to realise excellent performance in a certain product characteristic, e.g. quality); and III) focus (or niche). The chosen strategy is written down into action programs. The next most important step is to translate strategy into implementation and control. Usually, the environment changes during the planning period, meaning that adjustments remain necessary. The more turbulent the environment the more and deeper changes may be asked from both the company and the business unit to respond to the new challenges. If all planning tasks are performed well, an excellent company may result. According to Peter Drucker an excellent company does the right things *(being effective)* and does things right *(being efficient)* at the same time. He also believes that doing the right things is more important than doing things right. Generally, inter-modal freight terminals are not perceived as excellent companies. Terminals seem to fall - to a certain extent – in the category of being effective. The terminal operator is active in a high growth market (double-digit growth).

2.3 Business planning and the S WOT-Analysis

Important elements of the planning process are strengths, weaknesses, opportunities, and treats (SWOT) of the current company or business unit. Customer groups that will be served, customer needs that will be met, and alternative technologies that will satisfy customer needs define the company's business (see Figure 2).

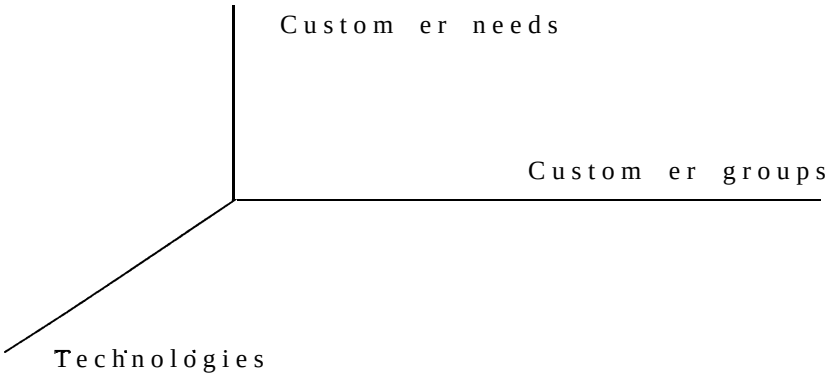

Figure 2: Elements that define a company's businesses
Source: Kotler, 1997

Customer needs, defined from the terminal operator viewpoint, can be container transhipment, container transport via rail, road and barge, and logistics services. The corporate management is able -with the business unit plans- to decide which businesses to build, maintain, harvest or divest. Many analytical tools have been developed in the past decades to structure the business unit evaluation. Two well-known models to evaluate business units are the Boston Consulting Group Model and the General Electric Model.

The Boston Consulting Group Model is based on the market growth rate and the relative market share compared with the largest competitor. The positions of the different companies are depicted in a matrix. The position in the matrix represents the market growth rate and relative market share of the company or business concerned. This growth-share matrix logically consists of four cells: question marks, stars, cash cows, and dogs. These four types of businesses require different actions (build, maintain, harvest, or divest) from the corporate level.

In the General Electric approach, each business is ranked according to market attractiveness and competitive position. Only a strong position in an attractive market will prove successful in the long run. If one of these two elements is missing, a certain business will not be able to produce excellent profits. Market attractiveness varies according to market's size, annual market growth rate, historical profit margin, competitive intensity, technological requirements, inflationary vulnerability, energy requirements, environmental impact, and social/political/legal elements (must be acceptable). Competitive position varies according to market share, share growth, product quality, brand reputation, distribution network, promotional effectiveness, productive capacity, productive efficiency, unit costs, material supplies, R&D performance, and managerial personnel. Each factor is ranked from 1 (very unattractive) to 5 (very attractive). The rankings are then multiplied with the weights that reflect each factor's relative importance. Also the historical positions of each business unit and the expected future positions are important in this process. Finally, all the analytical tools that are used lead to a strategy for each identified business. Of course, portfolio models do have numerous advantages and disadvantages but at least they are helpful in the planning process (See for more details Kotler, 1997).

Usually, the projected sales per business unit are lower than the desired sales. To close this gap there are three strategies that may be helpful: intensive growth (use current businesses to achieve more growth), integrative growth (building or acquiring businesses that are related to the current portfolio) and diversification growth (build or acquire businesses that are not related to the current portfolio). Ansoff has identified a number of intensive

growth strategies. In his product/market growth matrix he made a distinction between the following four intensive growth strategies: *market penetration* (current products-current markets), *market development* (current products-new markets), *product development* (new products-current markets), *diversification* (new products-new markets).

Integrative growth may be brought about by a backward integration strategy, a forward integration strategy, or via horizontal integration. Backward integration is realised through the acquisition of suppliers. Forward integration is aimed at through acquiring customers (e.g. wholesalers or retailers). Via the acquisition of competitors horizontal integration is realised. Finally, growth may come from diversification. Concentric diversification is adding products that have technological and/or marketing synergies with existing products. Horizontal diversification comes from new products that may appeal to current customers. Finally, the company achieve conglomerate diversification through new businesses that have no connection with the current technology, products or markets.

3. Comparison of three case studies in Duisburg

3.1 Business planning in practice

The aim of this section is to provide a business plan (that is at the same time a corporate plan) for the DeCeTe-bargeterminal and a business plan for the present and future operations of the ECT-bargeterminal and the PKV-railterminal. All three terminals are located side by side near the Sudhafen. The industry competitors on the transhipment market in Duisburg are the DeCeTe-barge terminal, the PKV-railterminal, the ECT-bargeterminal, the Rhein-Ruhr-terminal, and other intermodal freight terminals within a radius of approximately 50 km around Duisburg. The customers of the DeCeTe-barge terminal are barges that are exploited by DeCeTe itself and local collecting/distributing trucks. The customers of the PKV-railterminal are Deutsche Bahn and other rail transport carriers that physically collect and distribute the containers to the PKV- terminal. Other customers are Transfracht and Kombiverkehr as organisers of combined transport solutions, and local collecting/distributing trucks. The customers of the ECT-bargeterminal are mainly barges from NPRC. The model in Figure 3 is meant to be helpful to structure the business planning process for the three terminals in Duisburg. The four groups of planning elements are grouped into company-related developments, company people, company characteristics and company performance. For all three terminals each sub-element out of the four groups is analysed in the following three sections.

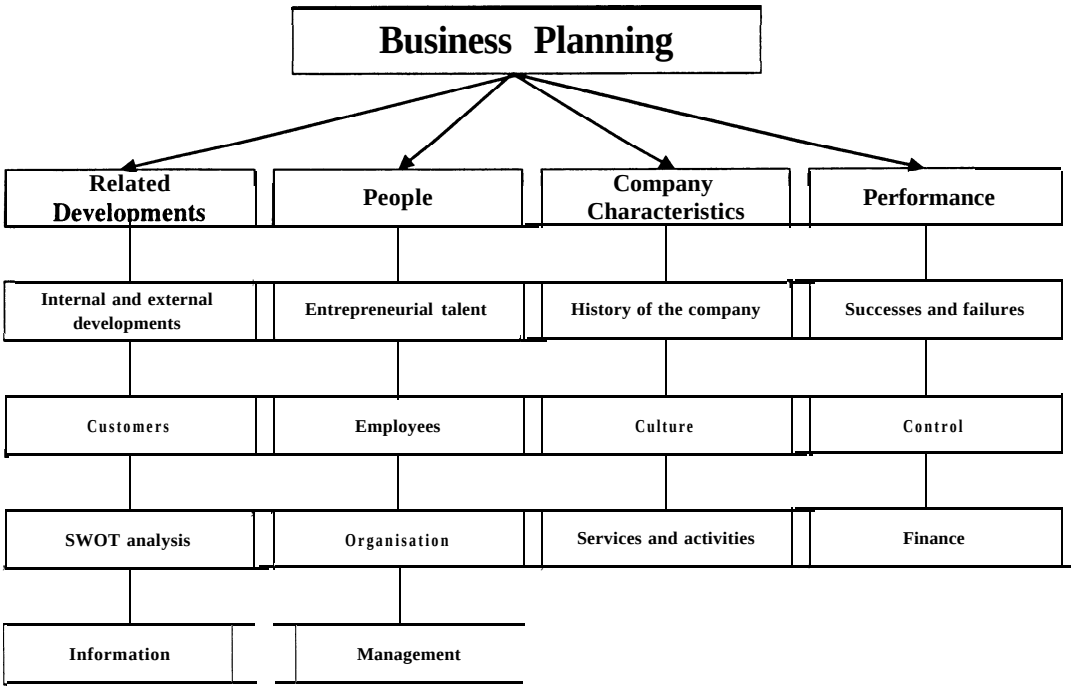

Figure 3: Four groups in the business planning process
Source: Wiegmans, 1999

3.2 The DeCeTe-bargeterminal Duisburg

The DeCeTe-bargeterminal is currently owned by the Buss Group from Hamburg, DB Cargo, and Scharrer that is a local trucking company. More recently, the terminal changed its role from handling coal and steal to primarily handling containers.

Internal and external developments
At the end of the 1990s we observe a number of developments that will have great influence on the freight transport market in Europe in the coming years. Among others, company's have to cope with: rising fuel prices, increasing importance of the environment, scale enlargement of transport companies, rising importance of combined transport, deregulation, and a low return on investment. At the moment the macroeconomic developments in Germany are not all positive. However, ICT developments may create new opportunities for many companies. The marketing opportunity of the DeCeTe-bargeterminal may consist of a very customer friendly approach towards its container transhipment clients. The external environmental threat for the DeCeTe-bargeterminal is formed by the ECT-bargeterminal.

Entrepreneurial talent
In 1996 the strategy of the DeCeTe-terminal has changed from: *"To act purely as a neutral container terminal and offered only terminal handling"* towards the strategy of *"offering intermodal services such as barging trucking and terminal handling while still remaining strictly neutral "*. This means that the DeCeTe-terminal both competes on the transhipment market and the container transport market in the region. Thus, neutrality is absolutely out of reach for this terminal. The DeCeTe-terminal competes with other terminals for transhipment volume. The change of strategy definitely shows an entrepreneurial mind, but the defined strategy does not go along with daily operations.

Customers

The terminal customers are rail-, road-, and barge carriers (DeCeTe, NPRC), combined transport intermediaries (organisers such as Transfracht and Kombiverkehr), and shipping lines (sea-carriers).

History of the company;
The DeCeTe-terminal was initially started as a terminal primarily handling coal and steel cargoes. The starting date of the terminal handling operations was in 1983. Duisburg Ruhrorter Hafen (DRH) initiated the initial terminal. DRH was also a major shareholder at the beginning, later it was handed over totally to private terminal operators. Currently, the private shareholders are the Buss Group from Hamburg with 5 1%, DB Cargo with 29%, and Scharrer (a local truck company) with 20%. More recently, it changed its role from handling coal and steal to primarily handling containers.

Successes and failures
The terminal harnessed its role as a Rhine port located in the Ruhr industrial region that has developed numerous road and rail connections throughout Europe. The terminal will find its main failure potential in a lack of space for expansion. The competitive advantages of the DeCeTe-terminal are claimed to be outstanding speed and competitive rates.

Employees
Generally, a company is as good as its people and the way they work together. At the DeCeTe-bargeterminal there are 25 employees.

Services and activities
At the moment, the terminal provides the following services: the organisation of collection and distribution of containers in the Duisburg region, transhipment between road and barge (and v.v.), transhipment between rail and barges (and v.v.), storage, and administration. In the future, the DeCeTe-terminal expects to increase its capacity utilisation of the transhipment throughput. The vast majority of DeCeTe's throughput is part of barge-road operations. The containers handled at the DeCeTe-bargeterminal mostly have a local origin/destination. The distance from the terminal is usually smaller than 30 km, but generally, traffic that moves within a 200-km radius of Duisburg is handled. At the other end of the networks the seaports of Rotterdam and Antwerp are not the final destinations or "original" origins. At the DeCeTe-terminal only maritime containers are handled.
The three core services of the terminal are local collection/distribution in the Duisburg region, barge-road transhipment and vice versa, and barge transport. The barge transport services are offered and exploited by DeCeTe itself. In 1996 DeCeTe started its own barge shuttle service with its own vessels sailing exclusively from its terminal to and from Antwerp and Rotterdam. Later on barge transport services were extended to Zeebrugge as well. The barge transport service availability is as follows:

Table 1. Barge service availability at the DeCeTe-bargeterminal

Barge service	Frequency
Duisburg-Antwerpen	2 times per week (in both directions)
Duisburg-Rotterdam	5 times per week (in both directions)
Duisburg-Zeebrugge	1 time per week (in both directions)

Source: TERMINET WP7, IMPREND, 1999

The barge transport services can be characterised as point-to-point services; there are no calls at intermediate ports (such as Nijmegen). However, within Rotterdam and Antwerp several terminals are called at (the exact number varies according to the supply of containers). In addition, a regular coaster service exists between the DeCeTe-bargeterminal and Tilbury (since September 1998). Rheintainer Ltd. offers these transport services

(transport frequency is 2 times a week in both directions). Arriving times of the coaster in Duisburg: Tuesday morning and Friday afternoon. Departure times of the coaster in Duisburg: Tuesday evening and Friday evening. The current rail-barge transhipment are mainly repositioning of containers. Direct sequential chain movements (barge-rail) are very limited so far. Per day, about 60-100 containers are exchanged between the DeCeTe-barge terminal and the PKV-rail terminal. About 80% of these containers are empty.

SWOT analysis

Strengths of the DeCeTe-bargeterminal are: it has a strong local basis, it has relative good rail connections, strong connection with Rotterdam leading to access to world-wide transport networks, entrepreneurial minded management, offering of own barge and road transport, and connection between barge, rail, and road. Weaknesses of the Duisburg terminal may consist of: Co-ordination of all the different actors and shareholders is difficult, it has defined the wrong strategy, relative weak position towards its customers, outstanding speed, and competitive rates.

Opportunities are formed by: the increasing interest in combined transport in general, scale increase of the combined transport actors, deregulation, the development of logistics sites near the terminals in Duisburg, increasing container traffic, and improved competitiveness of barge transport. Threats are found in: scale increase by terminal customers (decrease of terminal operator market power), and scale increase by suppliers.

At the moment, the terminal provides three core businesses: collection and distribution of containers in the Duisburg region, transhipment, and barge transport. From the developments it shows that all three businesses should be built or at least maintained. The future profit potential of each business has to be assessed (this is not possible due to a lack of data). A proper strategy may be *"Offering neutral terminal handling service and intermodal services such as barging and trucking"*. This strategy may be realised by exploiting niches and by being innovative.

A market-based business definition should not be to narrow. The DeCeTe-bargeterminal may perceive itself as a transhipment company, it may also see itself as a combined freight transport company (currently) and expand into offering combined transport services. The broadest possible concept is that of a logistics service provider.

Management & Organisation

The DeCeTe-terminal services are set by the three shareholders, together with the terminal management.

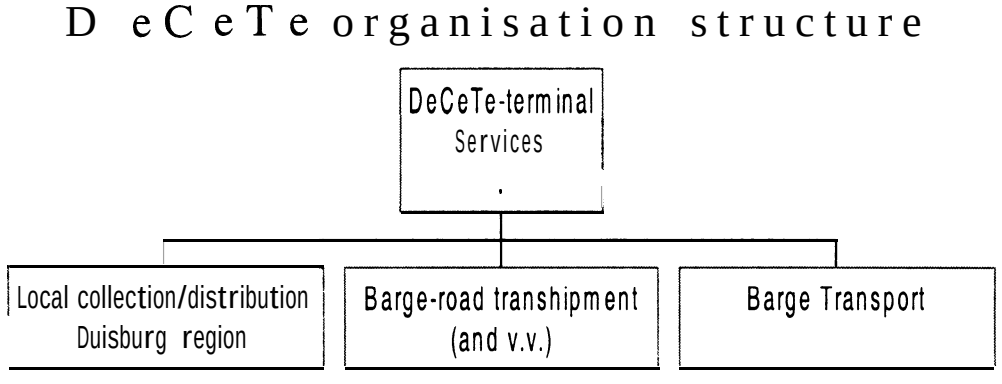

Figure 4: The organisation structure of the DeCeTe-bargeterminal
Source: Wiegmans, 1999

Control & Information

The vessels arrive at the DeCeTe-bargeterminal in the morning (around 9.00-10.00). The vessels leave the DeCeTe-terminal in the evening (around 22.00). The capacity of the vessels

ranges from 120-200 TEU (80-133 containers). The transport transit time from Duisburg to Rotterdam is four hours by road and 13 hours (on average) by barge (10 hours downstream16 hours upstream). By train it takes around 10 hours (approximately 3 hours for a passenger train) from Rotterdam to Duisburg. At present, the crane performance is about **25** moves/hour. The capacity of the vessels being exploited is between 120-200 TEU. The discharging and loading time of a barge varies from 3-5 hours, if the barge is 100% loaded or discharged. [(120TEU/1.5)/25 moves = 3 hours and 12 minutes] up to [(200TEU/1.5)/25 moves = 5 hours and 20 minutes]. The terminal operator should develop completely new businesses that are not related to the current business portfolio (diversification growth). This may take the form of a two-way telecommunication system between the terminal operator and the transport companies. The real costs per mobile station are . 1818 of which the barge terminal may ask . 455 as a contribution from the transport company. The costs of an operational immobile station (including software) are around . 20.455 (IMPREND, 1999).

Finance

The costs are based on articles in newspapers, interviews with terminal management teams and on reports on this subject. We try to indicate the expected financial results and the accompanying risks. We try to incorporate the yearly results, investments needed (donor support or self-financing). These results in market conform cost structures for each terminal. The disadvantage is that in practice most terminals are subsidised by local, regional and national governments in order to stimulate combined transport and also to improve the competitive position. Generally, sales per container along the Rhine are around . 36 for a complete terminal handling.

Table 2. Terminal cost characteristics DeCeTe-Duisburg per year

Terminal resources	costs
2 cranes	. 570,000 (2 x • 5,270,000)/20 years
2 reachstackers	• 48,875 (2 ⊠ • 488,750)/20 years
2 forklifttrucks	• 23,375 (2 ⊠ • 233,750)/20 years
700 meter quay	• 1,606,500 (700 meter x • 45,900)/20 years
Terminal area (8 ha)	• 216,920 (• 547,723 x 8 ha)/20 years
Storage area	Included in terminal area costs
Interest (10%)	• 275,862 (0.10 ⊠ • 2.758,607)
Buildings	• 21,250 (• 425,000/20 years)
Generator	• 34,000 (• 680,000/20 years)
Communication	• 21,250 (• 425,000/20 years)
Company car	• 3,937 (11,900/3 years)
Computers and software	• 127,500 (• 637,500/5 years)
Other	• 85,000 a year
Wages	• 325,875 (25 people x • 13,035)
Electricity (fixed)	• 8 1,600 (• 10,200 x 8 ha.)
Electricity (variable)	• 166,400 (• 1.28 x 130,000 TEU)
Fuel	• 166,400 (• 1.28 x 130,000 TEU)
Computer	• 187,000
Insurance	• 198,900 (• 1.53 x 130,000 TEU)
Overhead	. 1,317,500
Total costs/container	• 63,21 (• 5,478,1 19/86,667 containers)
Total costs/TEU	• 42,14 (• 5,478,1 19/130,000TEU)

Source: based on several ECT annual reports, and Drewry Shipping Consultants, 1998, WP7, IMPREND, 1999

If we take a close look at the different cost categories we observe the following: a number of cost categories that are more or less fixed, and a number of cost categories that vary according to the transhipped volume and other terminal services provided. This terminal has the following more or less fixed cost categories: cranes, mobile equipment, quay, terminal area, interest, buildings, generator, communications, company car, computers and software, and other costs. Cranes and mobile equipment are based on new prices and written down in

20 years. Of course, in practice second hand cranes can be used and written down in 30 years. Quay cost represents a huge amount of money. Very often this type of cost, together with the terminal area and buildings, is subsidised by local, regional or national governments.
Variable cost for the DeCeTe-bargeterminal include wages (25 persons), electricity (fixed and variable), fuel, computer, insurance, and overhead. If all costs are calculated conform market principles this results in total costs per container of . 63.2 and of . 42.1 per TEU.
The DeCeTe-bargeterminal sales are estimated at 86,667 containers x . 35,8 = . 3,102,679 per year. This would mean a loss of . 2,375,440 per year. However, in practice total costs will be much lower due to subsidies by the government. If we assume that the quay and overhead are paid by the government: total terminal costs are . 5,478,119 - . 1,606,500 - . 1,317,500 = • 2,554,119. This results in costs of . 29.5 per container and . 19.65 per TEU.

Conclusion
The principle agents in the combined transport channel of the DeCeTe-bargeterminal are: The Buss Group from Hamburg with 5 1% of the terminal, DB Cargo with 29% of the terminal, and Scharrer (a local truck company) with 20%. The terminal operator may improve its market power in the combined transport chain by buying the stake of DB Cargo. DB Cargo strives for its own goals and those goals do interfere with the strategy of the terminal operator. In fact, DB Cargo is a competitor of the DeCeTe-bargeterminal in the field of combined transport. Furthermore, DB Cargo owns the PKV-railterminal in Duisburg.
A European logistics operator or a global terminal operator may be looked for to co-operate or be acquired by. The most money is made in the out-souring of logistics operations and the terminal operator should strive to be part of that sector. This creates probably a lot of transhipment volume for the terminal operator. The terminal operator may look for acquisitions in the field of physical transport. To become a real intermodal transport company this is the best way. The operator is already practicing this way by its own barging services and the trucking in the Duisburg region. The most fruitful strategy for the DeCeTe-bargeterminal may be differentiation (try to realise excellent performance in a certain product characteristic, e.g. quality) and focus (or niche) on the Duisburg region.

3.3 The PKV-railterminal Duisburg

The PKV-railterminal is owned by Deutsche Bahn and functions at the moment primarily as a begin-end terminal for container transhipment. This terminal forms a small part of the company strategy of Deutsche Bahn.

Internal and external developments
At the moment the macroeconomic developments in Germany are not all positive. The marketing opportunity of the PKV-railterminal may consist of a very customer friendly approach towards the new ECT-bargeterminal. The external environmental threat for the PKV-railterminal is formed by the policy of DB.

Entrepreneurial talent
The PKV-railterminal is a non-innovative freight terminal that is mainly interested in filling container transhipment capacity. The management of the PKV-terminal only exploits the terminal. Deutsche Bahn does the corporate strategic management and is responsible for setting the long-term planning objectives. The PKV-railterminal management is responsible to provide an adequate Return on Investment. Within the framework that is provided by Deutsche Bahn, the railterminal has certain degrees of freedom. The PKV-terminal aims to increase the loading degrees of trains, to increase the frequencies of the rail services that arrive and depart from its terminal, and to offer better price/quality ratio's per transhipment.

Customers
Intermodal rail bounded organisers (such as Transfracht, Kombiverkehr etc.) are the contractual (paying) clients of the terminal operator. Rail carriers (such as DB Cargo, NS Cargo, etc) are also clients of the PKV-railterminal. A temporary transfer of Transfracht's (TFG) Rotterdam shuttle and Kombiverkehr's Poland services away from the PKV-railterminal caused a sharp decline in transhipments in 1996.

History of the company
The PKV-railterminal was initially started as a begin-end terminal for Deutsche Bahn. Collection and distribution in the Duisburg region forms the basis for this terminal.

Successes and failures
The terminal faces problems because of the pricing structure in general -per transhipment- that is imposed by Deutsche Bahn. DB sets the guidelines for the transhipment pricing structure, which are implemented by the terminal management. The PKV-railterminal offers storage, transhipment, and collection and distribution in the Duisburg region. Deutsche Bahn (50%) and Kombiverkehr (50%) own the terminal; nevertheless it is a public terminal. The terminal is currently being expanded. An additional terminal area of 170.000 m2 will be created. The expanded terminal will have 8 rail tracks of 700 m long and 1 rail track of 400 m long. Throughput capacity will rise to 220,000 containers (units). The terminal enlargement is expected to be ready in 2001.

Employees
About 25 people are employed at the terminal.

Services and activities
The two core services of the terminal are local collection/distribution in the Duisburg region, and rail-road transhipment and vice versa, and some direct rail-rail transhipment. Per day, about 60-100 containers are exchanged between the DeCeTe-barge terminal and the PKV-rail terminal. About 80% of these containers are empty. Deutsche Bahn offered special low transport rates for empty containers to bring them to Duisburg by rail. Recently, Deutsche Bahn changed this practice (prices have been raised) in order to be able to better reflect corresponding costs. The PKV-terminal has operating hours of 06.00-21.00 from Monday to Friday and on Saturday from 06.00-12.00.

Table 3. International services from the PKV-railterminal

	Duisburg - Busto Arsizio	Duisburg – Poland	Duisburg – Scandinavia	Duisburg – Muizen	Duisburg – Rotterdam
Frequency	5 times a week	3 times a week / 2 times a week	5 times a week	5 times a week	5 times a week
Load units	containers, swapbodies and trailers			containers	containers
Type	direct train (shuttle)	-		shuttle	shuttle
Train capacity	22 wagons per train	-		60 - 80 TEU	81 TEU (one way)
Transit time	around 20 hours				around 10 hours

Source: TERMINET WP7, IMPREND, 1999, GEM Consultants, 1999

SW OT analysis
Strengths of the PKV-railterminal are: the overnight container block-trains, connection between barge, rail, and road and local collection and distribution. Weaknesses of the Duisburg terminal may consist of: scale increase by terminal customers, container export is much larger than import, policy is set by DB and there is no entrepreneurial talent at the

terminal. Opportunities are formed by: the increasing interest in combined transport in general, scale increase of the combined transport actors, deregulation, the development of logistics sites near the terminals in Duisburg, increasing container traffic, and improved competitiveness of barge transport. Threats are found in: scale increase by terminal customers (decrease of terminal operator market power), and scale increase by suppliers. At the moment, the terminal provides two core businesses: collection and distribution of containers in the Duisburg region and transhipment. From the developments it shows that both should be maintained or phased down. The future profit potential of each business has to be assessed (this is not possible due to a lack of data). A proper strategy may be *"Offering neutral terminal handling service and connecting inter-modal services such as trucking"*. A market-based business definition should not be to narrow. The PKV-railterminal may perceive itself as a transhipment company, it may also see itself as a combined freight transport company and expand into offering combined transport services. The broadest possible concept is that of a logistics service provider. The only option for the PKV-railterminal is probably cost reduction. DB sets the business strategy and the terminal has no degree of freedom to innovate, diversify, or exploit niches.

Management & Organisation

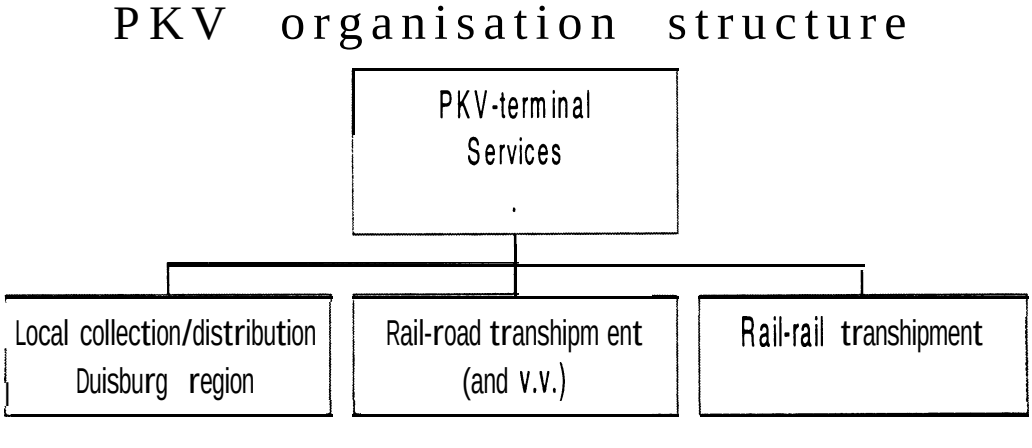

Figure 5: The organisation structure of the PKV-railterminal
Source: Wiegmans, 1999

Control & Information

The terminal can be characterised as a begin/end-terminal. The transhipment operations are mainly from truck to train and v.v. Nevertheless, about 10 - 15% of all transhipments (12,800-19,200 containers per year) at the PKV-terminal are rail/rail handlings. Because of the gap between arrival and departure times of trains the transhipment usually takes place via the storage area. For example, Transfracht is using Duisburg as a rail transfer point. Containers arriving from Rotterdam are transhipped in Duisburg onto trains directed to destinations in Europe. Generally, trains arrive at the PKV-railterminal in the morning (before 06.00) and leave the terminal in the evening (after 21 .OO). This relates to the regime for the utilisation of rail capacity on the trunk rail routes. Rail track capacity is mainly reserved for freight trains in the time window of 21.00 hours to 06.00 hours.

Finance

The costs are based on articles in newspapers, interviews with terminal management teams and on reports on this subject. We try to indicate the expected financial results and the accompanying risks (in terms of feasibility) for the terminal. This results in market conform cost structures for each terminal. The disadvantage is that in practice most terminals are subsidised by local, regional and national governments in order to stimulate combined

transport and also to improve the competitive position. Generally, sales per container along the Rhine are around • 36 for a complete terminal handling. PKV-railterminal sales: 128,000 containers x • 35,8 = • 4,582,400.

Table 4. Terminal cost characteristics PKV-railterminal Duisburg per year

Terminla resources	costs
2 cranes	• 570,000 (2 x • 5.270.000)/20 years
2 reachstackers	• 48,875 (2 ⊠ • 488,750)/20 years
1 forklifttrucks	• 23,375 (2 ⊠ • 233,750)/20 years
4.200 meter rails	• (4,200 meter x •)/20 years
Terminal area (10 ha)	• 273,862 (• 547,723 x 10 ha)/20 years
Storage area	Included in terminal area costs
Interest (10%)	• (0.10 x •)
Buildings	• 2 1,250 (• 425.000/20 years)
Generator	• 34,000 (• 680.000/20 years)
Communication	• 21,250 (• 425.000/20 years)
Company car	• 3,937 (11.900/3 years)
Computers and software	• 127,500 (• 637,500/5 years)
Other	• 85,000 a year
Wages	• 325,875 (25 people x • 13,035)
Electricity (fixed)	• 102,000 (• 10,200 x 10 ha.)
Electricity (variable)	• 245,760 (• 1.28 x 192,000 TEU)
Fuel	• 245,760 (• 1.28 x 192,000 TEU)
Computer	• 187,000
Insurance	• 293,760 (• 1.53 x 192,000 TEU)
Overhead	• 1,317,500
Total costs/container	• (• /128,000 containers)
Total costs/TEU	• (• /192,000TEU)

Source: based on several ECT annual reports, and Drewry Shipping Consultants, 1998, WP7, IMPREND, 1999

Conclusion

The principle agents in the combined transport channel of the PKV-railterminal Inter-modal rail bounded organisers (e.g. Transfracht, Kombiverkehr, etc.). The terminal operator may improve its market power in the combined transport chain by forming part of a good quality rail network of DB. A European logistics operator or a global terminal operator is no option for the PKV-railterminal to co-operate or be acquired by. Scale enlargement of DB Cargo probably will create a lot of transhipment volume for the PKV-railterminal. The terminal operator may look for an improvement of the pre- and end-haulage in the Duisburg region. The most fruitful strategy for the PKV-railterminal may be overall cost leadership. The only degree of freedom the terminal operator has is trying to realise the lowest costs per transhipment.

3.4 The ECT-bargeterminal Duisburg

The ECT-bargeterminal in Duisburg is a recent initiative from ECT Rotterdam. This terminal is constructed in order to relieve congestion at the ECT terminal in Rotterdam.

Internal and external developments;

At the moment the macroeconomic developments in Germany are not all positive. However, the marketing opportunities for the ECT-bargeterminal are very positive. The external environmental threat for the PKV-railterminal may be competition with DeCeTe and PKV.

Entrepreneurial talent

In 1998 ECT decided to develop its own barge-terminal in Duisburg. This terminal will function as an 'outpost' terminal of ECT-Rotterdam. It is part of the strategy of ECT to

improve the opportunities for barge transport and to offer their customers a better service. Barge transport between ECT-Rotterdam and ECT-Duisburg could be envisaged as inter-terminal transport. The ECT-Duisburg terminal, located adjacent to the DeCeTe-terminal, has become operational in 1999.

Customers
The main customer will be ECT.

History of the company
The main goal of the ECT-bargeterminal in Duisburg is to solve or decrease the congestion at the ECT-terminal in Rotterdam. The terminal expects to increase its influence in the combined transport chain and to increase the capacity of the ECT-terminal in Rotterdam by transporting the containers earlier to Duisburg. The goal is then to improve the capacity usage of the ECT Rotterdam terminal. The terminal has about the same structure as the PKV-railterminal. Guidelines for costs and prices will be (partly) imposed by the ECT-terminal in Rotterdam.

Successes and failures
The terminal has been operating for a short period.

Employees
Generally, a company is as good as its people and the way they work together. At the moment there are only 2 employees at the ECT-bargeterminal in Duisburg.

Services and activities
The ECT-terminal is providing the following inter-modal functions: direct transhipment between barges, transhipment between rail and barges, transhipment between barges and road, and storage of containers. The administration (information related) will be done in Rotterdam. The crane covers 2/3 of the total terminal area and because of its large front reach it is possible to handle two barges next to each other. The throughput is estimated at **25.000** containers for its first year of operation. For 2005 the expected volume is 120,000 containers (180,000 TEU). Barge transport between both ECT-terminals is co-ordinated by ECT and resembles inter terminal transport. Daily services will be offered in both directions. ECT aims to link the barge services to attractive connecting rail services from Duisburg. In addition, ECT is investigating opportunities to develop two rail terminals of its own in Eastern Europe (one along the route to Warsaw, the other along the route to Salzburg/Ukraine). The competitive advantage of the ECT-terminal is that containers will be directly transferred from barge to container block-trains. The corporate strategy is to relieve the congestion in the Rotterdam terminal. Rotterdam generates 100% of transport volume (containers) of ECT-Duisburg.

SWOT analysis
Strengths of the ECT-bargeterminal are: improvement of price/quality ratio of terminal transhipment services, strong connection with Rotterdam leading to access to world-wide transport networks, ECT developed an innovative concept, high frequency of barge services, and 2 barges can be handled side-by-side. Weaknesses are: dependence on Rotterdam traffic, difficult position towards other terminals in Duisburg. Opportunities are formed by: the increasing interest in combined transport in general, scale increase of the combined transport actors, deregulation, the development of logistics sites near the terminals in Duisburg, increasing container traffic, and improved competitiveness of barge transport. Threats are found in: scale increase by terminal customers (decrease of terminal operator market power), and scale increase by suppliers. At the moment, the terminal provides one core service: transhipment of containers. From the developments it shows that the service should be built

in order to realise the prospects. The future profit potential of each business has to be assessed (this is not possible due to a lack of data). A proper strategy may be "Offering *terminal transhipment service* ***for*** *ECT Rotterdam* ". A market-based business definition should not be to narrow. The ECT-bargeterminal may perceive itself as a transhipment company, it may also see itself as a combined freight transport company and expand into offering combined transport services. The broadest possible concept is that of a logistics service provider. The option for the ECT-bargeterminal is probably to be innovative and exploit niches.

Organisation & Management

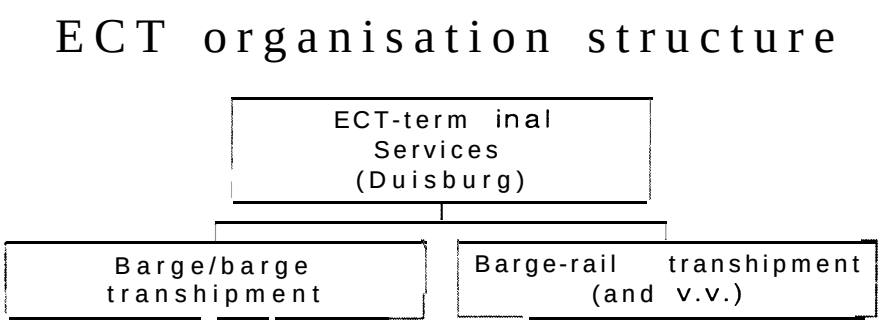

Figure 6: ECT-Duisburg organisation structure
Source: Wiegmans, 1999

Control & Information

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Finance

In this section we try to gain insight into the cost structure of the three terminals in Duisburg both separately and together functioning as one terminal. The costs are based on articles in newspapers, interviews with terminal management teams and on reports on this subject.
This results in market conform cost structures for each terminal. The disadvantage is that in practice most terminals are subsidised by local, regional and national governments in order to stimulate combined transport and also to improve the competitive position. Generally, sales per container along the Rhine are around • 36 for a complete terminal handling.

Table 5. Terminal cost characteristics ECT-Duisburg per year

Terminal resources	costs
1 crane	. 263,500 (1 x . 5,270,000)/20 years
1 reachstacker	. 24,438 (1 x . 488,750)/20 years
1 forklifttruck	. 11,688 (1 x • 233,750)/20 years
400 meter quay	. 9 18,000 (400 meter x . 45,900)/20
Terminal area (5 ha)	. 136,93 1 (• 547,723 x 5 ha)/20 years
Storage area	Included in terminal area costs
Interest (10%)	. 161,349 (0.10 x . 1,613,494)
Buildings	. 21,250 (• 425,000/20 years)
Generator	. 0 (• 680,000/20 years)
Communication	. 21,250 (• 425,000/20 years)
Company car	. 3,937 (11,900/3 years)
Computers and software	. 127,500 (• 637,500/5 years)
Other	. 85,000 a year
Wages	. 65,175 (5 people x . 13,035)
Electricity (fixed)	. 5 1,000 (• 10,200 x 5 ha.)
Electricity (variable)	. 48,000 (• 1.28 x 37,500 TEU)
Fuel	. 48,000 (• 1.28 x 37,500 TEU)
Computer	. 187,000
Insurance	. 57,375 (• 1.53 x 37,500 TEU)
Overhead	. 1,317,500
Total costs/container	. 141,96 (• 3,548,893/25,000 containers)
Total costs/TEU	. 94,64 (• 3,548,893/37,500TEU)

Source: based on several ECT annual reports, and Drewry Shipping Consultants, 1998, WP7, IMPREND, 1999

If we take a close look at the different cost categories we observe the following: a number of cost categories that are more or less fixed, and a number of cost categories that vary according to the transhipped volume and other terminal services provided. This terminal has the following more or less fixed cost categories: cranes, mobile equipment, quay, terminal area, interest, buildings, generator, communications, company car, computers and software, and other costs. Cranes and mobile equipment are based on new prices and written down in 20 years. Of course, in practice second hand cranes can be used and written down in 30 years. Quay cost represents a huge amount of money. Very often this type of cost, together with the terminal area and buildings, is subsidised by local, regional or national governments. Variable cost for the ECT-bargeterminal include wages (5 persons), electricity (fixed and variable), fuel, computer, insurance, and overhead. If all costs are calculated conform market principles this results in total costs per container of . 141.96 and of . 94.64 per TEU. The ECT-bargeterminal sales are estimated at 25,000 containers x . 35,8 = . 895,000 per year. This would mean a loss of . 2,653,893 per year. However, in practice total costs will be much lower due to subsidies by the government.

Conclusion

The principle agent in the combined transport channel of the ECT-bargeterminal is ECT Rotterdam. ECT Rotterdam owns 100% of the terminal. The terminal operator may improve its market power in the combined transport chain by competing with the two other terminals. The ECT-bargeterminal in Duisburg forms part of the world-wide network of the transhipment company Hutchison Whampoa from Hong Kong. The terminal operator may try to realise scale economies from these world-wide operations. Transhipment volume is more or less guaranteed. The terminal operator may try to form part of a European wide network of inland terminals. The most fruitful strategy for the ECT-bargeterminal may be focussing (or niching) on handling transhipment volume to and from Rotterdam.

4. Conclusion

Corporate planning is the first task a company performs. If a company consists of more divisions and/or businesses, the corporate strategy is translated into a division and/or business strategy via division and business planning. Important tasks of business planning are external environment analysis (finding opportunities and threats). Internal environment scanning is done through analysing strengths and weaknesses of the company and the businesses. A business is evaluated in fields like marketing, finance, manufacturing, and organisational capabilities according to the corporate strategy. From the scanning process the goals of the business unit follow. Goals have to be translated into a strategy in order to realise the goals stated. Corporate planning and business planning are ongoing processes; a business plan is nothing, business planning is everything. Generally, intermodal freight terminals are not perceived as excellent companies however, the terminal operator is active in a high growth market (double-digit growth) with many opportunities. Business planning may form a helpful framework for the terminal operators to realise these opportunities.
The DeCeTe-bargeterminal may improve its market power in the combined transport chain by buying the stake of DB Cargo. DB Cargo strives for its own goals and those goals do interfere with the strategy of the terminal operator. In fact, DB Cargo is a competitor of the DeCeTe-bargeterminal in the field of combined transport. Furthermore, DB Cargo owns the PKV-railterminal in Duisburg. The terminal operator may look for acquisitions in the field of physical transport. To become a real intermodal transport company this is the best way. The operator is already practicing this by offering its own barging and trucking services in the Duisburg region. The most fruitful strategy for the DeCeTe-bargeterminal may be differentiation (try to realise excellent performance in a certain product characteristic, e.g. quality) and focus (or niche) on the Duisburg region. Obviously, the DeCeTe-bargeterminal has been active in the business planning process. However, the resulting strategy is not the right one. It is impossible to remain neutral when barging and trucking services are provided, besides transhipment. The proposed strategy may result from the three owners of the terminal. The strategy may be the compromise that result from the business planning that was conducted. A new clear strategy has to be defined and growth should be aimed for through integrative growth in the Duisburg region.

The PKV-railterminal may improve its market power in the combined transport chain by forming part of a good quality rail network of DB. Scale enlargement of DB Cargo probably will create a lot of additional container transhipment volume for the PKV-railterminal. The terminal operator may look for an improvement of the pre- and end-haulage in the Duisburg region. The most fruitful strategy for the PKV-railterminal may be overall cost leadership. The only degree of freedom the terminal operator has is trying to realise the lowest costs per transhipment. Deutsche Bahn determines the corporate strategy which serves as the bases of the PKV business plan. The PKV-railterminal is just conducting the corporate plan from DB. The most likely growth strategy for the PKV-railterminal is integrative growth.

The ECT-bargeterminal may improve its market power in the combined transport chain by competing with the two other terminals. The ECT-bargeterminal in Duisburg forms part of the world-wide network of the transhipment company's Hutchison Whampoa from Hong Kong. The terminal operator may try to realise scale economies from these world-wide operations. Transhipment volume is more or less guaranteed. The terminal operator may try to form part of a European wide network of inland terminals. The most fruitful strategy for the ECT-bargeterminal may be focussing (or niching) on handling transhipment volume to and from Rotterdam. The growth strategy that ECT Rotterdam is following is integrative growth.

If the business planning is executed well, a good business plan that structures the opportunities, threats, strengths, and weaknesses that faces the terminal operator results.

From the conducted business planning process goals and action programs result. Generally, three types of strategies can be distinguished: I) overall cost leadership (try to realise the lowest costs); II) differentiation (try to realise excellent performance in a certain product characteristic, e.g. quality); and III) focus (or niche). Usually, the external and internal environment changes during the planning period, meaning that adjustments for the business plan remain necessary. If all planning tasks are performed well, an excellent company may result. Action programs are translated into growth strategies. Growth can be achieved via three ways: intensive growth (use current businesses to achieve more growth), integrative growth (building or acquiring businesses that are related to the current portfolio), and diversification growth (build or acquire businesses that are not related to the current portfolio).

The most important lessons from this article are the following:

1. Business planning provides a very useful framework to structure the planning process for the terminal operator. The three case studies suggest that the planning process by terminal operators can be improved;
2. Strategic and business planning is an ongoing process;
3. The terminal operators should aim for growth via a well-defined growth strategy (intensive-, integrative-, or diversification growth);
4. The terminal operator should have a clear overall strategy of overall cost leadership, differentiation, or focus.

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Annex 1: Terminal resources

Table 1. Terminal characteristics DeCeTe-Duisburg

Terminal resources	Characteristic
Number of cranes:	2
Mobile equipment:	2 reachstackers 2 forklifttrucks (one for empty boxes, one for loaded boxes)
Total quay length:	700 meter
Total terminal area:	8 ha = 80,000 m^2
Throughput capacity:	150.000 TEU = 100,000 containers (based on 1.5 TEU per container)
Stacking height:	3 high (under the crane), 4 high (in containterdepot)
Storage capacity:	ca 5000 TEU = 3,333 containers
Crane performance:	40 moves/hours (ideal circumstances), 25 moves/hours, (with high utilisation of the stack under the crane)
Current throughput	130.000 TEU (1998) (= 86,667 containers) ? (1995), 63.000 TEU (1996), 90.000 TEU(1997)
Capacity utilisation	86.7% (130,000/150,000)
Throughput/meter quay	185.7 TEU/ meter quay (= 124 containers/meter quay)
Throughput/hectare	16,250 TEU (= 10,833 containers)

Source: based on several ECT annual reports, TERMINET WP7, IMPREND, 1999

Table 2. Terminal characteristics PKV-railterminal

Terminal resources	Characteristic
Total terminal area	100.000 m2 = 10 ha.
Rail tracks	6 parallel rail tracks of 700 m long (Five tracks are located directly under the container cranes. One track has a separate location. At this track trains can only be handled by reach stackers. It is mostly used in case of lack of capacity)
Throughput capacity	ca. 130.000 units (=195,000 TEU = 130,000 containers)
Storage capacity	1100 units (1,943 TEU = 1,100 containers)
Cranes	2 gantry cranes (lifting capacity of 48,5 tonnes each)
Crane performance	30-35 moves/hour
Stacking height	2 high (under the crane), 4 high (in containerdepot)
Current throughput	128.000 units (1998) (= 192,000 TEU = 128,000 containers) [38.000 units (1992), 49.000 units (1993), 96.000 units (1995), 83.000 units (1996)]
Capacity utilisation	98.5% (128,000/130,000)
Throughput/meter rails	30.5 units/meter rails (128,000/4,200) (= 45.8 TEU = 30.5 containers)
Throughput/hectare	12,800 units (= 19,200 TEU = 12,800 containers)

Source: based on several ECT annual reports, TERMINET WP7, IMPREND, 1999

Table 8. Terminal characteristics ECT-terminal Duisburg

Terminal resources	characteristic
Number of cranes:	1 (front reach: 24 meter)
Mobile equipment:	Unknown
Total quay length:	360 meter (400 meter)
Total terminal area:	5 ha = 50,000 square meter
Stacking height:	Unknown
Storage capacity:	4000 TEU (= 2,667 containers)
Throughput capacity	80,000 containers (= 120,000 TEU)
Crane performance:	Unknown
Current throughput	25.000 units (1999) (= 37,500 TEU = 25,000 containers) 120.000 (2010) (= 180,000 TEU = 120,000 containers)
Throughput/meter quay	69.4 units/meter quay (= 104.1 TEU/meter quay = 69.4 containers/meter quay)
Throughput/hectare	5,000 units (= 7,500 TEU = 5,000 containers)
Capacity utilisation	31.3% (25,000/80,000)

Source: based on several ECT annual reports, TERMINET WP7, IMPREND, 1999